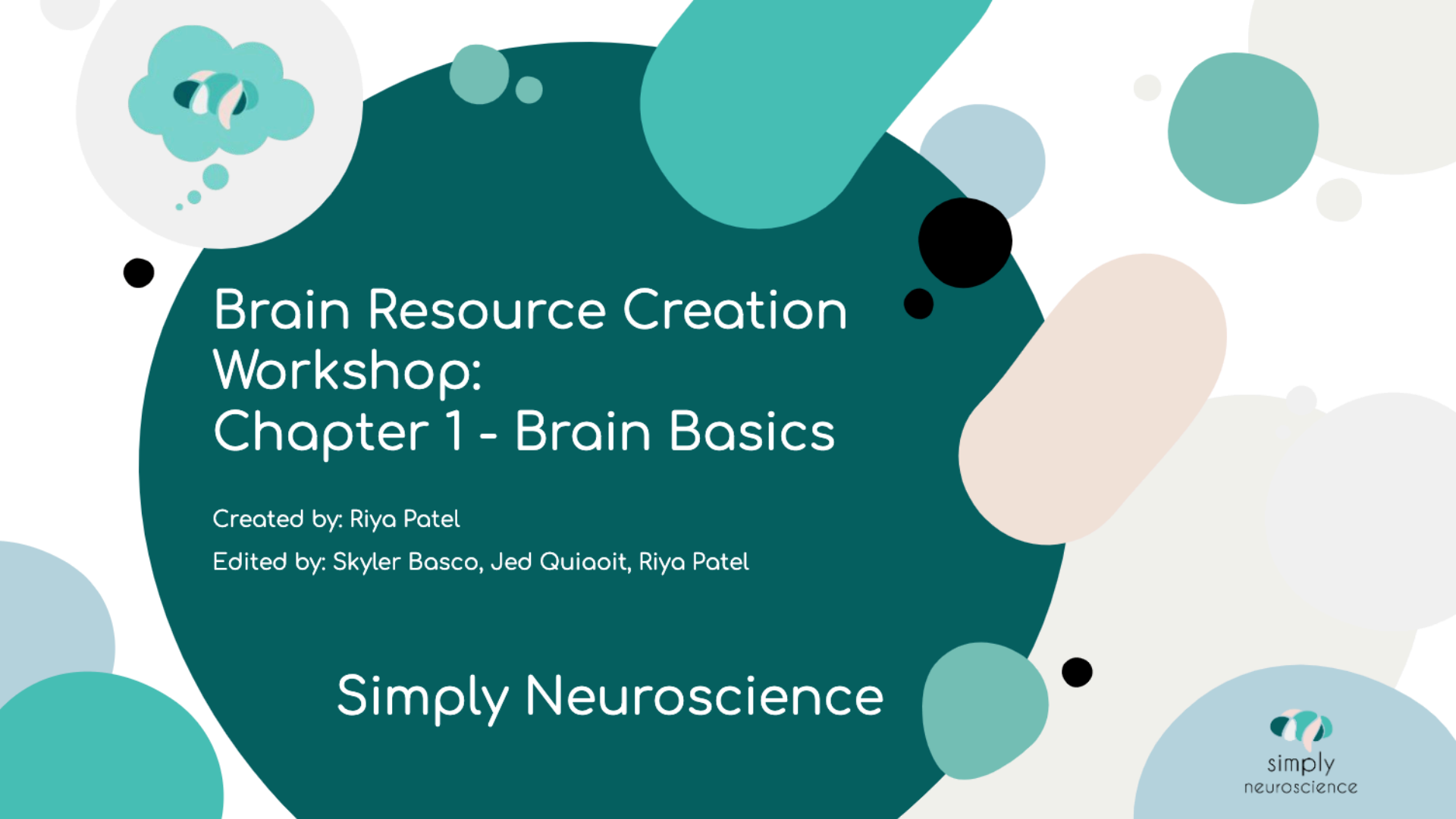




Brain Resource Creation Workshop: Chapter 1 - Brain Basics

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Simply Neuroscience

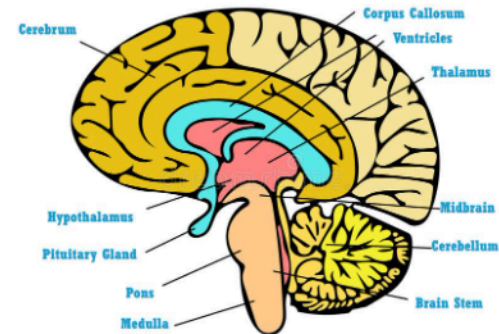
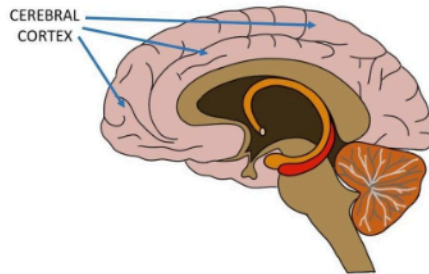
What is the Brain?

- “Nerve center” of your body
- Contains billions of neurons
 - Transmit information from body & outside world
- Programs responses
 - Conscious/Unconscious Movements
 - Thoughts, emotions, memories
- Splits into regions that are specialized for specific tasks and abilities



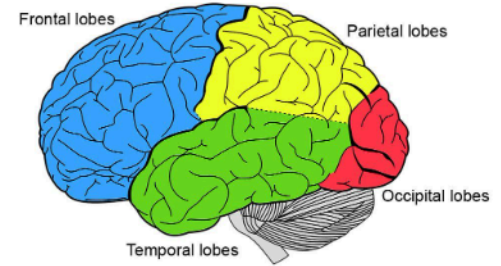
Major Brain Landmarks

- The largest part of the brain is the Cerebrum
 - Divided into two separate hemispheres
- Largest of nerve bundles forms a bridge between the cerebral hemispheres and is called Corpus Callosum
- Surface of the cerebrum is deeply folded layer of nerve tissue is called the Cerebral Cortex



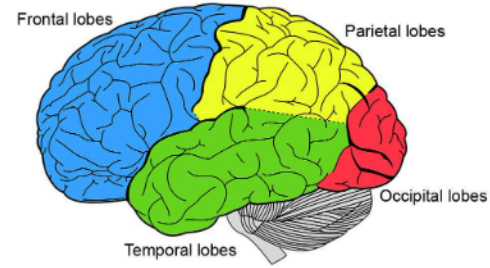
What are the four lobes of the brain?

- Frontal Lobes
 - Front of the brain (above eyes)
 - Coordinate voluntary movements and speech, memory and emotion
 - Higher cognitive skills: planning and problem solving
- Parietal Lobes
 - Top of brain (behind frontal lobes)
 - Integrate sensory signals from skin
 - Process taste and some visual information



What are the four lobes of the brain?

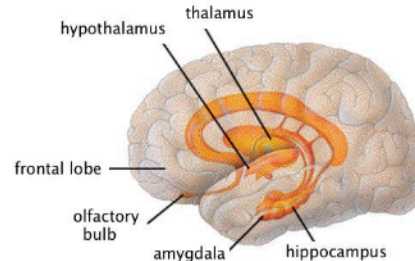
- Occipital Lobes
 - Process visual information
 - Responsible for recognizing colors and shapes
- Temporal Lobes
 - Lie on the sides of the brain (below eye level)
 - Some visual processing and interpret auditory information



Other Brain Landmarks

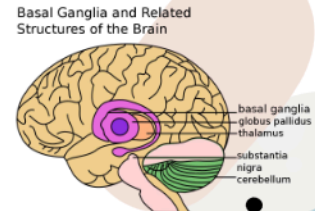
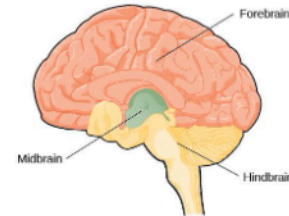
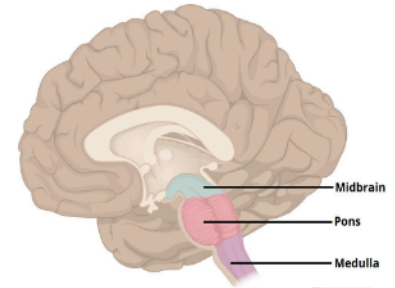
- Limbic System: regulates emotion and motivation
 - Hippocampus: creates new memories
 - Amygdala: integrates memory and emotion
- Thalamus: integrates sensory information and relays it to other parts of the brain
- Hypothalamus: sends hormonal signals to the rest of the body through the pituitary gland

These structures + cerebral cortex = forebrain



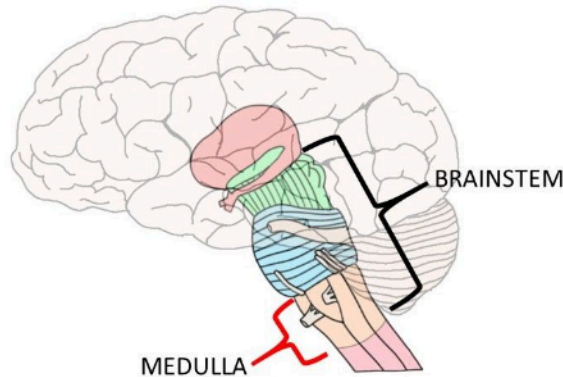
Brain Landmarks cont.

- Midbrain
 - Beneath the thalamus
 - Contains neurons that coordinate eye movements and trigger reflexes to sounds
- Basal Ganglia
 - Helps regulate complex body movements
- Hindbrain
 - Roles in glucose regulation and sleep
 - Includes regions that help control movement
- Cerebellum
 - Second largest part of the brain is volume
 - Contains over half of the brain's neurons
- Pons
 - Influences breathing and posture



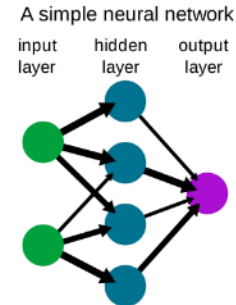
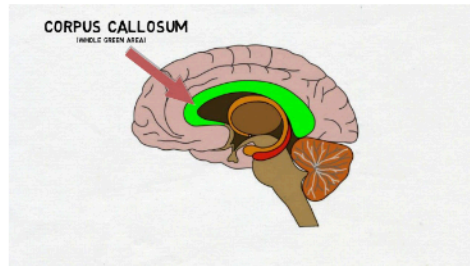
Brain Landmarks cont.

- Medulla
 - Carries nerve pathways
 - Connects brain to spinal cord
 - Contains neural networks that help control basic functions



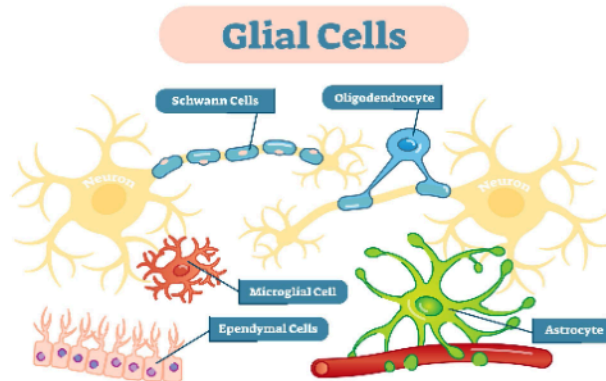
Neural Networks

- Major Nerve Tracts
 - Corpus Callosum: thick bundle of neurons connecting your left and right cerebral hemispheres
 - Smaller Anterior Commissure: transmits signals between the left and right temporal lobes
- Neural Network: a group of nerve tracts connecting a series of regions in the brain



Neurons and Glia etc.

- 4 main types of glial cells
 - Astrocytes: regulate ion concentrations around neurons, provide them with nutrients, and help regulate the formation of new connections between neurons
 - Microglia: main “immune” cells of the brain; help protect the brain from damage
 - Ependymal cells: line the inside of the ventricles
 - Oligodendrocytes: produce myelin in the CNS

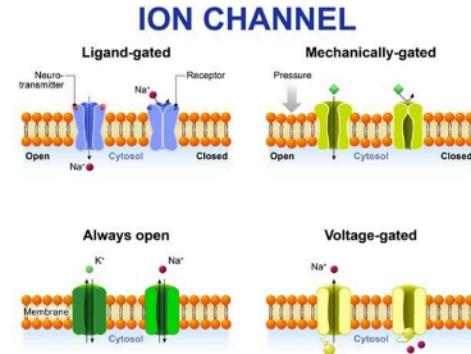


ushions the brain

by wrapping axons in

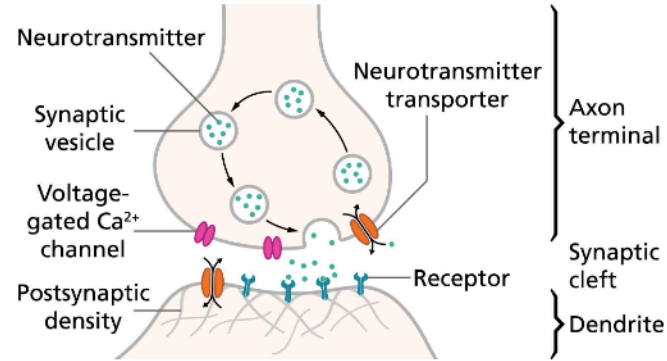
Ion Channels and Action Potentials

- Ions: electrically charged atoms
- Ion Channels: tunnel-like proteins
- Depolarized: less negative membrane potential
- Hyperpolarized: more negative membrane potential
- Action Potential: electrical impulse which moves down the axon towards the next neuron



Synapses and Neurotransmission

- Synapses: junctions between neurons
- Neurotransmitters: chemical signals that are passed and cross the synapse
- Reuptake: reabsorption of neurotransmitters by the axon terminal
- The brain's most common excitatory neurotransmitter: glutamate
- The brain's most common inhibitory neurotransmitter: GABA (gamma-aminobutyric acid)



Receptors and Molecular Signaling

- Hormones: send the brain specific cues about the condition and activity of distant tissues in the body
- Neuromodulators: endocannabinoid that seem to suppress neurotransmitter release
- Prostaglandins: small lipids that change the brain's response to pain and inflammation



We hope you enjoyed the workshop!

Any questions?

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